eISBN 978-1-60805-818-1
ISBN 978-1-60805-819-8

Social Network Analysis

An Introduction with an Extensive Implementation to a Large-Scale Online Network Using Pajek



Seifedine Kadry & Mohammed Z. Al-Taie

Bentham e Books

Social Network Analysis:
An Introduction with an Extensive Implementation to a Large-Scale Online Network Using Pajek

Authored By

Seifedine Kadry

School of Engineering
American University of the Middle East
Kuwait

Co-Author

Mohammed Z. Al-Taie

Computer Science Department
Al-Salam University College in Baghdad
Iraq

Bentham Science Publishers
Executive Suite Y - 2
PO Box 7917, Saif Zone
Sharjah, U.A.E.
subscriptions@benthamscience.org

Bentham Science Publishers
P.O. Box 446
Oak Park, IL 60301-0446
USA
subscriptions@benthamscience.org

Bentham Science Publishers
P.O. Box 294
1400 AG Bussum
THE NETHERLANDS
subscriptions@benthamscience.org

CONTENTS

FOREWORD

SOCIAL NETWORK CULTURE

Social networks, also referred to as social media, include many internet-based tools that help people to comprehend, interact, engage and collaborate with each other. Several social networking platforms such as Facebook, YouTube, LinkedIn, Twitter, and many Web based communities *e.g.* Book Crossing, are heavily being used nowadays in professional life and in some decision making processes.

By its nature, social networking is interactive. You can express your feedback and share your experiences with anyone that you select and *vice versa*. Many businesses recognize the importance of the quality of the provided end-services, but when it comes to embracing the principles of openness and interaction that social networking enables, they may hesitate. After all, there may be just as much unfavorable feedback as there is favorable feedback out there. However, it's the combination of both the positive and the negative that can truly empower organizations to make meaningful changes to enhance the quality of services. Social networks certainly make listening easier, but it's the collection of data and the actions that organizations take that build enduring relationships with customers [Karen Quintos].

WHY SOCIAL NETWORK ANALYSIS?

Social networks operate on several levels, from individuals, families, and groups up to the level of nations, and play a critical role in determining the way problems are handled, organizations are run, and the degree to which individuals achieve their goals. Social network theory maps these relationships between individual actors. Though relatively new on the scene it has become very influential across the social sciences and became a powerful methodological tool alongside statistics.

Assuming no prior knowledge of quantitative sociology, this book presents the key ideas in context through examples and case studies. Using a structured approach to understanding work in this area, Drs. Al-Taie and Kadry suggest

further reading and online sources so readers can develop their knowledge and skills to become practitioners of this research area. The authors show how we can practically analyze an on-line community, from different sides, using techniques of social network analysis and learn how to extract the main features of that network.

This reference provides a broad overview on the problem of Social Network Analysis with an extensive implementation to a large-scale online network using Pajek. The analysis deals with a well-known Web-based community that is *'Book Crossing'*.

The book is intended for students and non-specialist readers who want to learn the basics and the applications of social network analysis and not its mathematical properties. The book can also be an enriching source for researchers and practitioners aiming at understanding how the process of large-scale network analysis goes on by providing them with a set of useful techniques that have been developed in the last few years.

Aziz M. Barbar
Dean, Faculty of Arts & Sciences
American University of Science and Technology
Beirut, Lebanon

PREFACE

Social network analysis focuses on ties among people, groups of people, organizations and countries. These ties combine to form networks. It has become a powerful methodological tool alongside statistics.

The book lies in a series of textbooks that explain the principles of social network analysis. Furthermore, it gives the reader a complete applicatory knowledge to perform a large-scale network analysis. Interested readers can apply the analysis techniques used in this book to other online social communities, such as Facebook, MySpace, *etc.*

The book consists of two main parts. The first part (part I) gives the elementary concepts of social network analysis, while the second part (part II) represents the methodological and the practical portion of the book.

The first part starts with an introduction to the main concepts used in this field, such as types of networks, graph theory, social networks and social network analysis, properties of networks *etc.* Then, it is followed by a brief description to some of the common tools that are used by scientists and researchers to analyze networks. Among those are Pajek, UCINET, Network Workbench and others.

Then, it moves to show where social network analysis can be applied, as it can be useful in a number of fields such as recommender systems, business, software development, health, animal social networks and so on.

The second part of the book is dedicated to show how we can practically analyze an on-line community, from different sides, using techniques of social network analysis and learn how to deduce the main features of that network, with the help of Pajek, a tool used to analyze and visualize large-scale networks. The analysis deals with a well-known Web-based community that is *'Book Crossing'*.

Book Crossing website is a place where people, of different ages and from different locations (who are interested in reading books), put their ratings for the books they read. Thus, users supply important information and provide the

opportunity for others to make use of the feedback with no need to buy the book beforehand.

The processing of that website comes from two angles: The first angle focuses on the direct relations between users and books. Many things can be inferred from this part of the analysis such as who is more interested in book reading and why? Which books are most popular and which users are most active and why?

What does it mean when two users like the same book? Is it the same as when two other users like thousand books instead of just one? Who is more likely to be a friend with whom and why? Is there any person in the community who is more qualified to establish large circles of social relations? These questions (and others) are to be answered throughout the other part of the analysis, which will take us to probe the potential social relations that exist within this community. Although these relationships are not showing explicitly, they can be induced with the help of affiliation network analysis and techniques such as m-slice and ego-network analyses.

The book is intended for students and public readers who want to learn the basics of social network analysis without going deep into its mathematical and statistical methods. We believe that many of them are interested in the application of social network analysis rather than in its mathematical properties. Therefore, part I of the book can be a good reference for them. The book is also good for researchers and practitioners aiming at understanding how the process of large-scale network analysis goes on. The second part of the book is probably more interesting to them.

For readers who want to extend their knowledge in this field, we refer to other books such as *Social Network Analysis: Methods and Applications,* by Stanley Wasserman and Katherine Faust, *Models and Methods in Social Network Analysis* by Carrington, Scott and Wasserman, *Exploratory Social Network Analysis with Pajek* by Wouter de Nooy, Andrej Mrvar and Vladimir Batagelj. Finally, a concise history of social network analysis can be found in *The Development of Social Network Analysis: A study in the Sociology of Science* by Linton C. Freeman.